Claims

What is claimed is:

1. A keep-warm system for a fuel cell power plant **(10)**, comprising:

a. a fuel cell stack assembly (CSA) **(12)** including an anode **(16)**, a cathode **(18)**, an electrolyte **(14)**, and a cooler **(20)**;

b. fuel supply means **(25)** for providing a supply of fuel, at least some of the fuel being supplied as reactant to the anode **(16)**;

c. a source of oxidant reactant **(22)** operatively supplied to the cathode **(18)**;

d. a water management system **(30, 28)** operatively connected to the cooler **(20)** of the CSA **(12)**;

e. thermal insulating means **(64)** enclosing at least one of the CSA **(12)** and the water management system **(30, 28)** for providing thermal insulation thereof; and

f. catalytic fuel burner means **(66)** operatively connected to the fuel supply means **(25)** and to the source of oxidant reactant **(22)** for catalytically reacting the fuel and oxidant and providing a source of heat, the burner means **(66)** being disposed and operative to supply heated gas into the thermal insulating enclosure means **(64)**, and to the at least one of the CSA **(12)** and the water management system **(30, 28)** in the thermal insulating enclosure means **(64)**.

2. The keep-warm system of claim **1** wherein the catalytic burner means **(66)** includes a catalytic surface **(72)** for combustively reacting the fuel in the

presence of oxidant in a flameless manner to release heat only in a thermal range less than about 1000^0 F.

3. The keep-warm system of claim **2** wherein the heat released by catalytic combustion at the catalytic burner means **(66)** is in the thermal range of about 200^0-700^0 F.

4. The keep-warm system of claim **2** wherein the source of oxidant reactant **(22)** is ambient air, the air being supplied to the catalytic burner means **(66)** and mixed with fuel from the fuel supply means **(25)** for combustively reacting the mixture in the presence of the catalytic surface **(72)** to release heat.

5. The keep-warm system of claim **1** wherein the fuel supply means **(25)** comprises a container of hydrogen stored under pressure.

6. The keep-warm system of claim **1** wherein both the CSA **(12)** and the water management system **(28, 30)** are substantially enclosed by the thermal insulating means **(64).**

7. The keep-warm system of claim **4** wherein the electrolyte **(14)** of the CSA **(12)** is a proton exchange membrane (PEM), the fuel from the fuel supply means **(25)** is hydrogen, and the heat released by catalytic combustion at the catalytic burner means **(66)** is in the thermal range of about 200^0 - 700^0 F.

8. In a fuel cell power plant **(10)** having a fuel cell stack assembly (CSA) **(12)** including an anode **(16)**, a cathode **(18)**, an electrolyte **(14)**, and a cooler **(20)**, a fuel supply **(25)** for providing fuel to at least the

anode **(16)**, a source of oxidant reactant **(22)** for supplying at least the cathode **(18)**, and a water management system **(30, 28)** operatively connected to the cooler **(20)** of the CSA **(12)**, the method of preventing freezing of water in freeze-sensitive parts of the fuel cell power plant **(10)** during shutdown, comprising the steps of:

a. selectively flowing **(62, 63, 69, 67)** fuel **(25)** and oxidant **(22)** to a catalytic fuel burner **(66)** during shutdown for catalytic combustion to provide heated gas;

b. convectively flowing the heated gas into heat transfer relation with the freeze-sensitive parts of the fuel cell power plant **(10)** to provide heat thereto; and

c. thermally insulating the freeze-sensitive parts of the fuel cell power plant **(10)** including the heated gas flowing in heat transfer relation therewith.